performing nth order Tikhonov regularization on each such extracted segment and said second matrix to restore the segment, adding such restored segments, and extracting an area of the added restored segments containing an object of interest to obtain restored image data containing a restored object of interest.

**6**. The method according to claim **5**, wherein the first matrix comprises an image scene containing the object of interest and background data, and wherein the second matrix comprises the image scene containing only the background data.

**7**. The method according to claim **5**, further comprising the step of low pass filtering the first and second matrices to the system cutoff frequency.

**8**. The method according to claim **6**, wherein the step of extracting a segment having coordinates which completely include a blurred version of an object of interest comprises extracting an area equal to the extent of such object of interest plus the diffracted energy associated with the object of interest.

**9**. The method of claim **5** wherein the optical system is diffraction limited.

**10**. The method of claim **8** wherein the optical system is diffraction limited.

**11**. In an optical system having a detector means and processor means in which image data is obtained comprising noisy blurred scene data containing an object to be reconstructed, and noisy blurred background data of the same scene, an apparatus for increasing the spatial resolution of the imaging data produced by the optical system for providing an image of higher resolution, comprising:

means for converting the imaging data into a first matrix;

means for regularizing the first matrix by performing nth order Tikhonov regularization to the first matrix to provide a regularized pseudo-inverse (RPI) matrix; and

means for applying the RPI matrix to the first matrix to provide a reconstructed image of said object.

**12**. The apparatus of claim **11** wherein the optical system is diffraction limited.

**13**. The apparatus of claim **11** wherein the optical system has a numerical aperture and the detector means has at least five detectors spread across the central lobe of the diffraction pattern determined by the numerical aperture.

**14**. The apparatus of claim **11**, wherein the RPI matrix is determined via a singular value decomposition (SVD) of the first matrix obtained from the point spread function of the optical system.

**15**. The apparatus of claim **11**, wherein the RPI matrix is determined using QR decomposition of the first matrix.

**16**. An apparatus for substantially increasing the spatial resolution of imaging data produced by an optical system comprising:

means for converting the imaging data into a first matrix $g_1$ comprising background data and object of interest data, and a second matrix $g_2$ comprising background data;

means for subtracting the second matrix $g_2$ from the first matrix $g_1$ to obtain a third matrix $g_3$ indicative of the difference between said first and second matrices;

means for specifying a position and a size of an object of interest in the third matrix $g_3$;

means for extracting from the third matrix at least a segment having coordinates which completely include a blurred version of the object of interest; and

means for performing nth order Tikhonov regularization on each such extracted segment and said second matrix to restore the segment, adding said restored segments, and extracting an area of added restored segments containing the object of interest to obtain the restored image data containing a restored object of interest.

**17**. The apparatus of claim **16** wherein the optical system is diffraction limited.

**18**. The apparatus of claim **16** wherein the optical system has a numerical aperture and the detector means has at least five detectors spread across the central lobe of the diffraction pattern determined by the numerical aperture.

**19**. The apparatus of claim **16**, wherein the first matrix comprises an image scene containing an object of interest and background data, and wherein the second matrix comprises the image scene containing only background data.

**20**. The apparatus of claim **19**, further comprising means for low pass filtering the first and second matrices to the system cutoff frequency.

**21**. The apparatus of claim **19**, wherein the means for extracting at least a segment having coordinates which completely include a blurred version of the object of interest comprises means for extracting an area equal to the extent of the object of interest plus the diffracted energy associated with the object of interest.

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